

Penicillin sensitivity of gonococci

An evaluation of monitoring as an index of epidemiological control

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Summary

The penicillin sensitivities of 1,167 gonococci isolated during a 30-month period from male patients, and 794 gonococci isolated from female patients were analysed retrospectively. More strains from males were relatively resistant than those from females, and a higher proportion of relatively resistant organisms was isolated from each sex when the infection had been acquired outside the area served by the clinic.

During the course of the study a fall in the number of relatively resistant strains was seen amongst the locally acquired organisms, whilst no such drop occurred in the strains acquired elsewhere; it is postulated that improved contact tracing may have been responsible. Regular monitoring of the penicillin sensitivity of gonococci has been shown to be a sensitive index of gonorrhoea control.

Introduction

The concept that the penicillin sensitivity of gonococci may be used as an index of control is not new (Morton and Higson, 1966; Lomholt and Berg, 1966), and regular monitoring has been advocated (Ronald, Eby, and Sherris, 1968).

In this retrospective study, the penicillin sensitivity of gonococci has been investigated with three objectives. Firstly to compare the penicillin sensitivities of gonococci isolated from male and female patients. Secondly, to compare the sensitivities of organisms acquired in the Sheffield area (referred to as 'local' strains), with those acquired in other areas (called 'elsewhere' strains). Finally, to test the assertion that penicillin sensitivity testing is an essential tool of control (Ronald and others, 1968)

by examining results obtained in the area of one clinic.

Patients and methods

During the 30-month period October 1, 1972, to March 31, 1975, the penicillin sensitivities were determined in 1,961 culture-positive cases of gonorrhoea isolated from patients attending the Sheffield Special Clinic. 1,167 had been isolated from males, and 794 from females, and these represented 91.1 and 80.4 per cent. respectively of the infections diagnosed in male and female patients.

A positive cultural diagnosis of *Neisseria gonorrhoeae* was established by sugar fermentation or by fluorescent antibody testing, and the penicillin sensitivity of subcultures was determined using a plate dilution method (Reyn, Bentzon, and Ericsson, 1963). The results obtained were expressed as 50 per cent. Inhibitory Concentrations (IC₅₀), and were standardized using reference strains from the State Serum Institute, Copenhagen. Cultures with IC₅₀ of 0.08 i.u. penicillin per ml. or more, were regarded as being relatively resistant.

The locale of the patient's infection was determined from the medical and social history. Local infections were taken as those acquired within the Sheffield city area. Infections resulting from exposures in the rest of the country and abroad were considered to have been caused by 'elsewhere' strains. Infections from abroad (1.41 per cent.) were not analysed separately.

The response to treatment was also investigated.

Recurrence of infection was defined as the finding of gonococci by Gram-stained smears or culture within 1 week of treatment with procaine penicillin, 1.2 m.u. for males and 2.4 m.u. for females.

Results

To provide data for longitudinal study, the results were divided into five consecutive 6-month periods; the total numbers of cases diagnosed were higher during the second and fourth periods, that is during the summer months, and more males than females acquired their infection 'elsewhere' (Table 1). Throughout the period of study, a higher proportion of males were infected with a relatively resistant strain than females, whether they were infected

TABLE I *Proportions of sensitive strains (SS), and relatively resistant strains (RRS) in infections acquired locally and elsewhere, where the penicillin sensitivity had been determined*

Sex	Study period of 6 mths	Total diagnosed (elsewhere strains per cent.)	No. with penicillin sensitivity determined	Acquired locally					Acquired 'elsewhere'				
				SS		RRS		Total	SS		RRS		Total
				Total	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	Per cent.
Male	1st	244 (21.3)	223	176	101	57.4	75	42.6	47	28	59.6	19	40.4
	2nd	294 (21.4)	269	216	138	63.9	78	36.1	53	30	56.6	23	43.4
	3rd	232 (37.1)	205	131	111	84.7	20	15.3	74	43	58.1	31	41.9
	4th	257 (24.9)	238	176	130	73.9	46	26.1	62	32	51.6	30	48.4
	5th	254 (26.8)	232	167	128	76.6	39	23.4	65	42	64.6	23	35.4
	Total	1281 (26.0)	1167	866	608	70.2	258	29.8	301	175	58.1	126	41.9
Female	1st	186 (23.1)	141	102	71	69.6	31	30.4	39	28	71.8	11	28.2
	2nd	204 (17.6)	170	141	102	72.3	39	27.7	29	20	69.0	9	31.0
	3rd	189 (17.5)	143	115	94	81.7	21	18.3	28	21	75.0	7	25.0
	4th	224 (19.2)	184	146	110	75.3	36	24.7	38	26	68.4	12	31.6
	5th	185 (15.7)	156	129	108	83.7	21	16.3	27	19	70.4	8	29.6
	Total	988 (18.6)	794	633	485	76.6	148	23.4	161	114	70.8	47	29.2

TABLE II *Recurrence rates after treatment in sensitivity (SS) and relatively resistant (RRS) infections*

Sex	Study period (6 mths)	Total cases	Cases in which penicillin sensitivity known							
			Known recurrences				SS			
			Rate per cent.		Total cases	Recurrences		Total cases	Recurrences	
			No.	Rate per cent.		No.	per cent.		No.	per cent.
Male	1st	244	7	2.87	129	0	0.00	94	7	7.45
	2nd	294	8	2.72	168	2	1.19	101	6	5.94
	3rd	232	7	3.02	154	3	1.95	51	4	7.84
	4th	257	7	2.72	162	3	1.85	76	4	5.26
	5th	254	5	1.95	170	1	0.59	62	4	6.45
	Total	1281	37	2.89	783	9	1.15	384	25	6.51
Female	1st	186	2	1.07	99	0	0.00	42	2	4.76
	2nd	204	1	0.49	122	0	0.00	48	1	2.08
	3rd	189	3	1.58	115	1	0.87	28	2	7.14
	4th	224	2	0.89	136	1	0.73	48	0	0.00
	5th	185	1	0.54	127	0	0.00	29	1	3.45
	Total	988	9	0.90	599	2	0.34	195	6	3.08

locally or elsewhere. With the 'elsewhere' strains, there was no appreciable change in the number of relatively resistant strains isolated from males or females during the study. In the local strains, however, the proportion of relatively resistant strains was seen to fall. Comparing the first and final years of the study, the number of relatively resistant local strains fell from 153 to 85 in males (39.0 per cent. to 24.8 per cent.) and from 70 to 57 in the local female strains (28.8 per cent. to 20.7 per cent.).

Table II shows that there was no appreciable change in the recurrence rate during the study period. When the organism was relatively resistant the recurrence rate was higher than when the organism was sensitive.

Discussion

The difference in the incidence of relatively resistant

strains isolated from male and female patients in this study was constant in each of the five study periods. Is a difference in sexual behaviour responsible? If a small number of females carrying relatively resistant strains was responsible for a high proportion of the male infections, this might account for the sex difference found. Should this be the case, it emphasizes the need for active contact tracing of the highly promiscuous female, whether a professional or an enthusiastic amateur.

The local pool of undiagnosed gonorrhoea is constantly being modified, for contact tracing and treatment of the asymptomatic carrier reduces the pool. At the same time, the promiscuous male having acquired infection from the pool, spreads the infection before developing symptoms or being traced. (Willcox, 1965a, 1965b). Strains from other parts of the country and abroad may also be introduced into

the local pool, and the latter may be more resistant (Warren, 1968). In this study, the sensitivities of the local and elsewhere strains have been monitored separately, and a difference has been found. Had they been considered together, the decrease in the number of resistant organisms found would not have been shown to be due to an improvement in the local pool.

Neither the number of cases diagnosed nor the recurrence rate during the period of study gave any indication of control, or of its lack. By monitoring the locally acquired infections, control, in terms of a drop in the proportion of relatively resistant strains of gonococci isolated, has been demonstrated. During the period of study a second trained social health worker was employed in the clinic to trace and bring in named male and female contacts of patients with gonorrhoea, and the change observed may have resulted from improved contact tracing.

It is concluded that, while there was no quantitative evidence of control in the study described, definite qualitative improvement in control during the period was apparent, and that penicillin sensitivity testing is not only an essential tool for assessing gross control, but also has potential to measure finely the quality of gonorrhoea control programmes.

References

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